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Redfish Catch Results from Summer 2000 Survey in Unit 2

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Abstract

To enhance the fisheries research database in Unit 2, NAFO Divisions 3Pn, 3Ps, 4Vn, and 4Vs, the Groundfish Enterprise Allocation Council (GEAC) has funded redfish surveys during winter 1997, and summer 1998, 1999, and 2000. The continuing intent is to maintain a series of annual summer surveys to complement current resource assessment activities carried out by the Department of Fisheries and Oceans (DFO). GEAC funded and performed the surveys with scientific guidance from DFO in the design and execution of a stratified random survey and the associated sampling. The data collected during these surveys have been subsequently analysed on behalf of GEAC and for the additional intent of providing this information to DFO, for their databases and their assessment work. This is the fourth such GEAC redfish survey in Unit 2 following on the previous 1997 to 1999 surveys. Catch statistics, length distribution, and stratified analysis estimates of redfish abundance and biomass, and interpretation of results are presented. The Unit 2 biomass estimate is 169 ktonnes compared with the 1997 to 1999 values of 240, 222, and 94 ktonnes respectively. The 1980 year-class is still "prevalent" and increased in numbers for 4Vn and 4Vs, with comparable numbers to 1999 in 3Ps and a slight reduction from 1999 in 3Pn. The 1988 year-class remains absent from 3Pn and 4Vn, is down slightly in 3Ps and up slightly from 1999 in 4Vs although still at levels slightly below those seen in 1997 and greatly reduced from those seen in 1998. The 1988 year class does appear to be gradually replacing the 1980 year class in the adult population as evidenced in 3Ps and 4Vs, although the 1988 year class is still not as strong is the 1980 year class. The 1994 year-class first seen in 3Pn in 1998 is now evident in 3Pn and also in 3Ps and 4Vn. The 2000 survey used a liner whereas the previous three years did not so that with this element of selectivity the surveys are not comparable in this one regard. Within the Laurentian Channel and slopes, where a great portion of the fish were caught in 2000 – the other area being on the southern reaches of the continental shelf – there continues to be a prevalence of fish towards the western reaches with a possible slight increase on the western 4Vs side compared to that to the east and 3Ps. Depth and oceanographic conditions may be factors associated with these aggregations.

Résumé

Pour améliorer la base de données de recherche sur les pêches pour l'unité de gestion 2 (sous-divisions 3Pn, 3Ps, 4Vn et 4Vs de l'OPANO), le Conseil des allocations aux entreprises d'exploitation du poisson de fond (GEAC) a financé des relevés du sébaste effectués à l'hiver 1997 et aux étés 1998, 1999 et 2000. Ces travaux ont pour but d'obtenir une série de relevés annuels d'été afin de compléter les activités d'évaluation des ressources que mène actuellement le Ministère des Pêches et Océans (MPO). Le GEAC a financé et réalisé les relevés avec l'aide du MPO, qui a fourni des conseils scientifiques pour la conception et la réalisation d'un relevé aléatoire stratifié et des échantillonnages connexes. Les données ainsi recueillies ont été analysées pour le compte du GEAC et en vue de les transmettre au MPO pour les bases de données et dans les travaux d'évaluation. Ce document aborde le quatrième relevé annuel du sébaste dans l'unité de gestion 2, lequel donne suite aux relevés effectués de 1997 à 1999. Le document présente des statistiques de capture, la distribution des longueurs, des estimations par analyse stratifiée de l'abondance et de la biomasse du sébaste ainsi que l'interprétation des résultats. La biomasse estimée pour l'unité de gestion 2 est de 169 kilotonnes, alors qu'elle se chiffrait à240, 222 et 94 kilotonnes en 1997, 1998 et 1999, respectivement. La classe d'âge de 1980 est encore dominante; son effectif a augmenté dans les sous-divisions 4Vn et 4Vs, s'est maintenue à un niveau semblable à celui de 1999 dans 3Ps et a légèrement fléchi dans 3Pn, par rapport à 1999. La classe d'âge de 1988 est toujours absente dans 3Pn et 4Vn; par rapport à 1999, son effectif a légèrement baissé dans 3Ps et légèrement augmenté dans 4Vs, mais à des niveaux un peu inférieurs à ceux de 1997 et beaucoup plus bas que ceux de 1998. Même si la classe d'âge de 1988 n'est toujours pas aussi forte que celle de 1980, la première semble remplacer graduellement la deuxième dans la population adulte, comme l'indiquent les données pour 3Ps and 4Vs. Observée pour la première fois dans 3Pn en 1998, la classe d'âge de 1994 est maintenant bien représentée dans 3Pn, 3Ps et 4Vn. Étant donné que, contrairement aux trois années précédentes, une doublure a été utilisée pour le relevé de 2000, les données des relevés ne sont pas comparables sur le plan de la sélectivité des engins. Dans le chenal Laurentien et ses pentes, où une partie importante des poissons ont été capturés en 2000 (l'autre secteur étant la partie sud du plateau continental), les poissons se concentrent davantage du côté ouest (4Vs), où leur nombre semble augmenter légèrement, plutôt que vers l'est et dans la sous-division 3Ps. La profondeur et les conditions océaniques pourraient être des facteurs liés à ces concentrations.

Introduction

To enhance the fisheries research database in Unit 2, NAFO Divisions 3Pn, 3Ps, 4Vn, and 4Vs, the Groundfish Enterprise Allocation Council (GEAC) has funded redfish surveys during winter 1997, and summer 1998, 1999, and 2000. The continuing intent is to maintain a series of annual summer surveys to complement current resource assessment activities carried out by the Department of Fisheries and Oceans (DFO). GEAC funded and performed the surveys with scientific guidance from DFO in the design and execution of a stratified random survey and the associated sampling. The data collected during these surveys have been subsequently analysed on behalf of GEAC and for the additional intent of providing this information to DFO, for their databases and their assessment work. This is the fourth such GEAC redfish survey in Unit 2 following on the previous 1997 to 1999 surveys (CSAS Research Document 99/155 [1]). Under contract to GEAC, AMEC has taken the set catch and length frequencies data logged using the DFO FFS system, and performed a first analysis of the survey results. This document presents these results.

Methods and Materials

A Stratified Random survey was carried out in Unit 2 by the *M.V. Cape Beaver.* A summary of the trip is presented below.

Trip 3: Stratified Random Survey
Trip 3 was carried out from 15-23 August 2000. These dates match the 31 August to 9 September 1999 survey and 16-23 August 1998 survey. The 1997 survey was carried out from 1-12 December. The *Cape Beaver* was also used in the 1997 and 1999 surveys. The *M.V. Cape Ballard*, a ship of comparable size and design, performed the 1998 survey. During the trip, length sampling was carried out on board, and the set details and length frequencies data were logged onboard in the DFO FFS system.

Tows of duration 30 minutes were conducted at a speed of 3.5 knots using a commercial Engel 170' bottom trawl with a 105-110 mm lined cod end. Performance of the trawl was checked onboard using Scanmar sensors and logged using Seatrawl software. The trawl gear and configuration were identical to those used in the 1997 to 1999 surveys with the exception that the 1997 to 1999 surveys did not use a liner.

A total of 94 successful stratified random tow sets were completed. One set was unsuccessful.

Results and Discussion

The set details and redfish length frequencies were exported from FFS to create ASCII digital data files.

ACON plots of the 2000 spatial distribution of catch weights are presented in Figure 1 together with results from the 1997 to 1999 surveys. Figure 1a shows a map illustrating the location of the strata surveyed. Table 1 presents a summary of the redfish set details and catch numbers and weights.

Nearly all sets were 30 minutes duration. Two sets 15 and 70 had durations of 20 and 15 minutes. The catches for all sets were adjusted to a standard 30 minute tow in the presentation of Table 1 and Figure 1 results and also in the stratified analysis (see below). The redfish were sampled in 1 cm length groupings and all ratio/percentages of catch measured were applied.

The mean redfish catch for the 94 stratified random sets is 553 fish and a mean catch weight of 256 kg. Redfish were caught in all successful sets.

Seven large catches exceeding 900 kg were obtained (sets 2,4,5,19,22,95) with four along the deep slopes of the continental shelf and three others located along the western deep slope sides of the Laurentian Channel. Five of these seven sets were in 4Vs including the three largest sets having catches of 2600 to 2825 kg. The two other largest sets are located in the southeast corner of 4Vn just south of 46°N and in 3Ps just south of 45°N. The majority of the remaining population is well distributed in numerous smaller sized pockets northwestward along the Laurentian Channel. Compared to the previous three years there appears to be some tendency for population concentrations towards the south. The pockets of catches in the 200 to 800 kg range present in 1997 and 1998 and to a lesser degree in 1999 located along the 4V-3P border between 46-47°N are scaled down and/or appear to be more greatly dispersed in that region in 2000.

Stratified Random surveys analysis was carried out using the DFO stratified analysis STRAP software and applying the French Exclusion Zone around St. Pierre et Miquelon for area calculations. A wingspread of 69 feet was used, consistent with the 1997-1999 analyses.

Table 2 presents mean weight per set and biomass estimates. Observations to make include:

- In 3Pn, the biomass estimate of 6362 t is down 40% from 1999 and down no more than 30% from 1997 and 1998. The overall 3Pn mean weight per set is 90 kg, a decrease from the rising trend seen in the previous three years: 108, 127, and 158 kg. In spite of this, the mean weights in 2000 are actually the largest in the four years for the 275-366 m "mid-depth" strata, eight to ten times larger than 1998 and 1999, and twice as large as that seen in 1997. The strata for the depths 185-274 m show the greatest reduction.

- In 3Ps, the biomass estimate of 37916 t is comparable to that for 1999 and 20% less than that for 1998, and 60% less than the 1997 estimate. The overall 3Ps mean weight per set is 128 kg and being of similar proportions less than the 1997 to 1999 counterparts. The range of mean weights, (95% upper and lower value) 71 to 184 kg, is noticeably tighter though than for the earlier years. This is also evident in Figure 1.

- In 4Vn, the biomass estimate of 32714 t is up 40% from 1999, but still roughly half the estimates for 1997 and 1998. The overall mean weight has increased to 168 kg. The mean weights in strata 415 and 416 are decreased, while for the deeper water stratum 417, the value is double that of 1999.

- In 4Vs, the biomass estimate is 92020 t, the largest value in the four years. This is almost five times larger than the 1999 estimate, is comparable to the 1998 estimate and is up 45% from 1997. The mean weight per set for 4Vs is 692 kg, with broad upper and lower limits.

- Overall, in Unit 2, the total biomass estimate for 2000 is 169 ktonnes, up 80% from the 1999 estimate of 94 ktonnes, and approximately 25% less than the 1997 and 1998 estimates of 240 and 222 ktonnes respectively.

Figure 2 presents the redfish survey abundance index at length values, by sex, for the 1997-2000 Unit 2 surveys. The 2000 distribution shapes are similar to those for 1999 with a general overall increase in abundance. Three modes are evident. The 1980 year class is clearly present in the 31-36 cm range. The 1988 year class is present in the 25-27 cm range for males and likely though not as evident, following on the mode in 1999, in the 28-31 cm range for females. A third mode 18-20 cm is also evident, most noticeably for females, likely the 1994 year class seen in 1998 in 3Pn (Figure 3). Consistent with the previous years, female sizes appear to be 2-4 cm larger than their male counterparts for a given year class grouping.

Figure 4 presents the male and female abundance distributions for all four years together. Except for 1998, the 1980 year class shows a greater proportion of the male population than the 1988 year class in all survey years. The 1980 year class abundance in 2000 is comparable in size and shape to that seen in 1998, about twice as large as that seen in 1999, and about half that seen in 1997. The 1988 year class in 2000 is comparable in size and shape to that seen in 1999, less than half the magnitude as that seen in 1997 with an increased shift of about 4 cm in the distribution, and considerably less than that seen in 1998. For males, the peaks for the 1980 year class group have increased by about 1 cm per year, from 31 cm in 1997 to 32 cm in 1998 and 1999 and to 33 cm in 2000. The 1988 year class group peaks have similarly increased from 24 cm in 1997 to 25 cm in 1998 and to 26 cm in 1999 and 2000.

For females, the 1980 year class shows a greater proportion of the female population than the 1988 year class in all survey years. The 1980 year class abundance in 2000 is increased by about a half from 1999 but still about half that

seen in 1997 and 1998. The 2000 peak of the 1980 year class mode is about twice as large as that seen in 1999, and about half that seen in 1997 and 1998. The 1988 year class in 2000 is comparable in size and shape to that seen in 1999, and considerably less than those seen in 1997 and 1998. As mentioned above, a third mode that appears to correspond to the 1994 year class is present at lengths 18-20 cm. The peak of this mode is at 19 cm for females and 20 cm for males in 2000. In 1998, in division 3Pn, there was a similar small peak at 16 cm. For females, the peaks for the 1980 year class group have increased by about 1 cm per year, from 33 cm in 1997 to 34 cm in 1998, to 33 cm in 1999 and up to 35 cm in 2000. The 1988 year class group peaks have stayed at around 27 cm for 1997 to 1999. As noted the peak for 2000 is not well-defined; however, the largest value appears at 30 cm.

Figure 3 presents the length distributions for each division for all four years of the GEAC surveys. The mean number per standard tow is presented. Figure 5 presents the same information, arranged with all four years together in a graph for each division.

In 3Pn, there is a continued presence of the 1980 year class in the 32-34 cm range, somewhat reduced in magnitude from the previous three years. There is almost an absence of fish in the 22-27 cm range corresponding to the 1988 year class. And, consistent with the 1998 survey, the 1994 year class is again apparent.

In 3Ps, the 1980 year class is still evident in the 33-36 cm range. The 1988 year class numbers are down with there no longer being a well-defined peak for that mode. The 1994 year class may be evident in the 19-21 cm range. Except for this new feature, numbers are down in 3Ps pretty well uniformly across all other lengths from those values seen in 1997 to 2000.

In 4Vn, the 1980 year class is present in the 32-35 cm range and up slightly from 1999 but noticeably reduced in magnitude from 1997 and 1998. As for 3Pn, there is almost a total absence of fish in the 22-27 cm range corresponding to the 1988 year class. And, as for 3Pn again, the 1994 year class is apparent at 19 cm.

In 4Vs, the 1980 year class is evident in the 34-35 cm range. This grouping is increased from that observed in the previous three years. The 1988 year class numbers are up slightly from 1999 but are down from 1997 and 1998 and as for 3Ps, though perhaps not to the same extent, the well-defined peak for that mode is either reduced in size and/or has moved into the 1980 year class group. There is also a small presence in the 42-43 cm range not evident in the previous years or the other divisions.

Summary

The following summary observations can be made:

- The Unit 2 biomass estimate of 169 ktonnes is up from the 1997 to 1999 values of 240, 222, and 94 ktonnes respectively more in keeping with the first

two years, although still down from those years but also suggesting that perhaps 1999's low values were an anomaly. A small caution with this estimate is that since a liner was used in 2000, some selectivity should be applied for comparison with the earlier years. At the same time, the additional redfish seen at the smaller lengths of 20 cm amount to 6% of the 2000 abundance estimate of 318 million. By comparison, very small amounts of about 1% or less of the fish caught in 1997 to 1999 are less than 20 cm, consistent with the absence of a liner. Overall, some level of stability can be inferred for the past four years. Continued annual surveys are required to monitor the stock status.

- The 1980 year-class is still "prevalent" and increased in numbers for 4Vn and 4Vs, with comparable numbers to 1999 in 3Ps and a slight reduction from 1999 in 3Pn.

- The 1988 year-class remains absent from 3Pn and 4Vn, is down slightly in 3Ps and up slightly from 1999 in 4Vs although still at levels slightly below those seen in 1997 and greatly reduced from those seen in 1998. The 1988 year class does appear to be gradually replacing the 1980 year class in the adult population as evidenced in 3Ps and 4Vs, although the 1988 year class is still not as strong is the 1980 year class.

- The 1994 year-class first seen in 3Pn in 1998 is now evident in 3Pn and also in 3Ps and 4Vn. As noted above, the 2000 survey used a liner whereas the previous three years did not so that with this element of selectivity the surveys are not comparable in this one regard. GEAC indicate they will do comparison fishing in 2001 to determine differences with and without a liner to make earlier surveys more comparable.

- Within the Laurentian Channel and slopes, where a great portion of the fish were caught in 2000 – the other area being on the southern reaches of the continental shelf – there continues to be a prevalence of fish towards the western reaches with a possible slight increase on the western 4Vs side compared to that to the east and 3Ps. Depth and oceanographic conditions may be factors associated with these aggregations.

Acknowledgement

The author would like to thank Don Power of DFO, and is most appreciative of his assistance in this work.

References

[1] Power, D., 1999. "The Status of Redfish in Unit 2." CSAS Research Document 99/155."

Table 1 Summary of Redfish Catches for Stratified Random Survey Sets, Unit 2, 15-23 August 2000.

Cape Beaver (vessel code 47) Trip 3

Set	Day	StrLin	Division	Unit Area	Set Location Lat (N)	Long (W)	Redfish Catch ** # of Fish	Catch ** Weight (kg)	Set Duration (min)	Tow Distance (n.mi.)	Redfish Mean Weight (kg)
1	15	451	4Vs	J34	44.17	58.29	238	25	30	1.8	0.11
2	15	468	4Vs	K34	44.24	57.80	7535	2647	30	1.8	0.35
3	15	451	4Vs	K34	44.35	57.85	367	87	30	1.8	0.24
4	15	399	4Vs	L33	44.57	56.92	3512	2600	30	1.8	0.74
5	16	708	3Ps	M33	44.85	55.70	5868	1686	30	1.8	0.29
6	16	708	3Ps	M33	44.95	55.54	1574	523	30	1.8	0.33
7	16	707	3Ps	N32	45.06	54.95	1367	218	30	1.8	0.16
8	16	318	3Ps	N32	45.08	54.86	165	39	30	1.8	0.24
9	16	707	3Ps	M33	44.96	55.53	1994	529	30	1.8	0.27
10	16	318	3Ps	M33	44.95	55.63	927	103	30	1.8	0.11
11	16	706	3Ps	L32	45.10	56.30	184	30	30	1.8	0.16
12	16	711	3Ps	L32	45.01	56.39	507	288	30	1.8	0.57
13	16	398	4Vs	L33	44.73	56.51	652	352	30	1.8	0.54
14	16	398	4Vs	L33	44.80	56.67	201	115	30	1.8	0.57
15	17	398	4Vs	K33	44.78	57.02	1011	594	20	1.2	0.59
16	17	398	4Vs	K33	44.85	57.02	228	145	30	1.8	0.64
17	17	398	4Vs	L33	44.97	56.92	375	221	30	1.8	0.59
18	17	398	4Vs	K32	45.09	57.07	202	125	30	1.8	0.62
19	17	397	4Vs	K32	45.22	57.18	4449	2825	30	1.8	0.63
20	17	399	4Vs	K32	45.14	57.45	256	157	30	1.8	0.62
21	17	400	4Vs	K32	45.22	57.57	274	157	30	1.8	0.57
22	17	448	4Vs	K32	45.27	57.71	966	1000	30	1.8	1.04
23	17	448	4Vs	K32	45.42	57.78	231	85	30	1.8	0.37
24	17	400	4Vs	K32	45.47	57.62	203	120	30	1.8	0.59
25	17	397	4Vs	K32	45.45	57.50	116	67	30	1.8	0.58
26	17	397	3Ps	K32	45.44	57.15	192	119	30	1.8	0.62
27	17	712	3Ps	K32	45.44	57.11	904	558	31	1.8	0.62
28	17	711	3Ps	L32	45.31	56.98	224	142	30	1.8	0.63
29	17	711	3Ps	L32	45.40	56.66	148	87	30	1.8	0.60
30	18	316	3Ps	L32	45.42	56.47	381	58	30	1.8	0.15
31	18	706	3Ps	L32	45.44	56.52	116	27	30	1.8	0.23
32	18	706	3Ps	L32	45.48	56.55	253	91	30	1.8	0.36
33	18	712	3Ps	L31	45.78	56.96	34	18	30	1.8	0.53
34	18	316	3Ps	L31	45.85	56.86	407	148	31	1.8	0.36
35	18	705	3Ps	K30	46.03	57.12	263	57	29	1.7	0.22
36	18	313	3Ps	K30	46.16	57.19	165	50	30	1.8	0.30
37	18	712	3Ps	K30	46.03	57.25	142	79	30	1.8	0.56
38	18	712	3Ps	K31	45.88	57.39	146	90	30	1.8	0.62
39	18	415	4Vn	K31	45.89	57.58	2024	1139	30	1.8	0.56
40	18	415	4Vn	K31	45.86	58.00	225	128	31	1.8	0.56
41	18	416	4Vn	J31	45.85	58.10	64	41	29	1.7	0.65
42	18	416	4Vn	J30	46.02	58.35	108	61	30	1.8	0.56
43	18	416	4Vn	J30	46.04	58.44	86	46	30	1.8	0.53
44	19	415	4Vn	J30	46.09	58.11	274	161	30	1.8	0.59
45	19	415	4Vn	J30	46.26	58.29	170	99	30	1.8	0.58
46	19	415	4Vn	J30	46.31	58.31	1264	724	29	1.7	0.57
47	19	714	3Ps	J29	46.53	58.03	123	77	30	1.8	0.63
48	19	713	3Ps	K30	46.42	57.95	157	91	30	1.8	0.58
49	19	713	3Ps	K30	46.38	57.89	141	84	30	1.8	0.60
50	19	713	3Ps	K30	46.23	57.93	421	257	30	1.8	0.61
51	19	713	3Ps	K30	46.23	57.72	168	102	30	1.8	0.61
52	19	313	3Ps	K30	46.26	57.28	100	16	30	1.8	0.16
53	19	705	3Ps	K30	46.36	57.39	122	55	30	1.8	0.45
54	19	713	3Ps	K30	46.40	57.59	60	34	30	1.8	0.57
55	19	310	3Ps	K29	46.70	57.46	99	49	30	1.8	0.49
56	19	716	3Ps	K29	46.78	57.54	117	55	30	1.8	0.47
57	20	715	3Ps	K29	46.71	57.74	246	121	30	1.8	0.49
58	20	715	3Ps	J29	46.93	58.03	171	96	30	1.8	0.56
59	20	714	3Ps	J29	46.96	58.06	71	38	30	1.8	0.54
60	20	714	3Ps	J28	47.07	58.30	133	73	30	1.8	0.55
61	20	714	3Ps	J29	46.85	58.73	69	43	30	1.8	0.62
62	20	714	3Ps	J29	46.72	58.48	160	99	30	1.8	0.62
63	20	714	3Ps	J29	46.89	58.23	99	58	30	1.8	0.59
64	20	415	4Vn	J29	46.81	58.55	89	51	30	1.8	0.57
66	20	415	4Vn	J30	46.46	58.53	160	96	29	1.7	0.60
67	20	415	4Vn	J30	46.37	58.80	209	125	30	1.8	0.60
68	20	415	4Vn	J29	46.51	58.73	180	107	31	1.8	0.60
69	20	415	4Vn	J29	46.60	58.83	177	106	[illegible]	1.8	0.60
70	21	416	4Vn	H29	46.55	59.27	342	186	16	0.9	0.54
71	21	415	4Vn	H29	46.71	59.34	283	174	30	1.8	0.61
72	21	415	4Vn	H29	46.86	59.37	86	56	30	1.8	0.64
73	21	415	4Vn	H29	46.94	59.53	55	31	30	1.8	0.56
74	21	415	4Vn	H28	47.14	59.54	55	34	30	1.8	0.62
75	21	417	4Vn	G28	47.07	60.10	317	141	30	1.8	0.44
76	21	417	4Vn	G28	47.21	60.26	612	76	30	1.8	0.12
77	21	415	4Vn	H28	47.32	59.77	123	43	30	1.8	0.35
78	21	415	4Vn	H28	47.37	59.61	56	30	30	1.8	0.54
79	21	304	3Pn	H27	47.50	59.33	1010	587	30	1.8	0.58
80	21	303	3Pn	H28	47.50	59.23	355	120	30	1.8	0.34
81	21	304	3Pn	H28	47.43	59.01	485	210	30	1.8	0.43
82	22	305	3Pn	H28	47.31	59.35	256	179	30	1.8	0.70
83	22	305	3Pn	H28	47.06	59.07	35	23	30	1.8	0.66
84	22	305	3Pn	J28	47.10	58.96	29	17	30	1.8	0.59
85	22	305	3Pn	J28	47.21	58.73	27	16	30	1.8	0.59
86	22	303	3Pn	J27	47.51	58.12	31	14	29	1.7	0.47
87	22	303	3Pn	J28	47.40	58.04	105	18	30	1.8	0.17
88	22	306	3Ps	J28	47.16	58.02	165	37	30	1.8	0.22
89	22	306	3Ps	K30	46.28	57.83	151	72	30	1.8	0.48
90	22	309	3Ps	K28	47.27	57.20	417	240	30	1.8	0.58
91	22	718	3Ps	K28	47.05	57.21	123	78	30	1.8	0.63
92	22	716	3Ps	K28	47.04	57.10	162	104	29	1.7	0.64
93	22	310	3Ps	K29	46.91	57.21	178	118	30	1.8	0.66
94	22	309	3Ps	K28	47.02	57.50	163	65	30	1.8	0.40
95	23	468	4Vs	J35	43.90	58.77	2069	945	30	1.8	0.46
					Minimum		27.0	14.5	15.0	0.9	0.11
					Maximum		7535.0	2825.0	31.0	1.8	1.04
					Mean		552.6	256.2	29.7	1.7	0.50
					Median		182.0	95.6	30.0	1.8	0.57
					Standard Error		122	55	0.0	0.0	0.00
					Total		51948.8	24084.3	2793.0	162.9	47.00
					Count		94	94	94	94	94

*** set catch numbers and weights adjusted to a standard 30 minute tow at 3.5 knots*

Table 2 Mean weight (kg) of redfish caught per standard 30 minute tow and survey biomass in UNIT2 during GEAC surveys from 1997-2000. (Numbers in brackets are successful sets, "-" indicates strata not sampled). Total abundance estimates are noted at the bottom of the table.

STRATUM	Depth Range (m)	Area sq. n. mi.	1997 Dec 1-12	1998 Aug16-23	1999 Aug31-Sep9	2000 Aug15-23
3Pn						
303	185-274	554	187.8 (2)	651.2 (2)	271.4 (3)	50.9 (3)
304	275-366	151	194.2 (2)	49.8 (2)	36.3 (2)	368.5 (2)
305	367+	733	27.2 (2)	76.8 (2)	96.7 (4)	58.8 (4)
Upper			828.3	982.8	443.2	175.8
Mean			108.4	126.7	157.7	90.4
Lower			-611.6	-729.4	-127.8	5.0
Biomass (metric tons)			7630	8918	11100	6362
3Ps						
306	185-274	363	0.1 (2)	11.7 (2)	9.2 (2)	54.5 (2)
309	185-274	296	10.7 (2)	106.4 (2)	411.0 (2)	149.0 (2)
310	185-274	170	-	20.7 (2)	8.4 (2)	70.5 (2)
313	185-274	165	10.6 (2)	10.6 (2)	5.0 (2)	33.0 (2)
316	185-274	189	40.6 (2)	68.3 (2)	19.1 (2)	104.5 (2)
318	185-274	129	1697.5 (2)	-	173.6 (2)	71.0 (2)
705	275-366	195	105.8 (2)	29.1 (2)	32.5 (2)	56.6 (2)
706	275-366	476	-	97.4 (2)	58.3 (3)	49.3 (3)
707	275-366	74	707.3 (2)	931.2 (2)	202.0 (2)	373.5 (2)
715	275-366	128	204.3 (2)	397.1 (2)	249.5 (2)	108.0 (2)
716	275-366	539	-	195.4 (2)	88.1 (3)	80.0 (3)
708	367-549	126	1267.8 (2)	995.3 (2)	1906.5 (2)	1104.5 (2)
711	367-549	593	482.1 (2)	173.1 (2)	75.0 (3)	172.3 (3)
712	367-549	731	74.5 (3)	160.4 (2)	64.9 (4)	190.8 (4)
713	367-549	851	1285.5 (4)	31.1 (3)	123.1 (5)	113.6 (5)
714	367-549	1047	236.2 (3)	312.4 (3)	99.3 (6)	64.7 (6)
709	550-731	147	-	-	-	-
Upper			903.1	267.4	552.2	184.2
Mean			444.4	173.3	135.5	127.6
Lower			-14.2	79.2	-281.2	71.0
Biomass (metric tons)			106329	50412	40273	37916
4Vn						
417	185-274	387	17.9 (2)	347.6 (2)	332.1 (2)	108.5 (2)
416	275-366	671	73.7 (2)	242.5 (2)	118.6 (4)	83.8 (4)
415	367-532	2915	416.7 (7)	347.6 (8)	92.5 (16)	195.5 (16)
Upper			1010.0	648.2	145.1	287.5
Mean			319.9	382.9	120.3	168.2
Lower			-370.2	117.6	95.4	48.9
Biomass (metric tons)			62219	74474	23391	32714
4Vs						
446	185-366	313	32.4 (2)	3550.8 (2)	-	542.5 (2)
451	185-366	147	1995.7 (3)	-	-	56.0 (2)
452	185-366	345	-	-	-	-
397	367-549	540	1403.5 (3)	279.0 (2)	106.2 (2)	1003.7 (3)
398	367-549	833	51.1 (4)	558.4 (3)	320.6 (3)	258.7 (6)
399	367-549	465	56.3 (3)	132.4 (2)	97.3 (2)	1378.5 (2)
400	367-549	270	36.6 (2)	78.4 (2)	93.4 (2)	138.5 (2)
468	367-549	148	1077.6 (2)	-	-	1796.0 (2)
Upper			828.8	6604.9	357.5	1924.1
Mean			478.5	747.6	187.3	692.1
Lower			128.1	-5109.7	17.1	-540.0
Biomass (metric tons)			63619	88601	19329	92020
TOTAL GEAC SURVEY BIOMASS			239797	222405	94093	169012
TOTAL ABUNDANCE (millions)			*486*	*497*	*182*	*318*

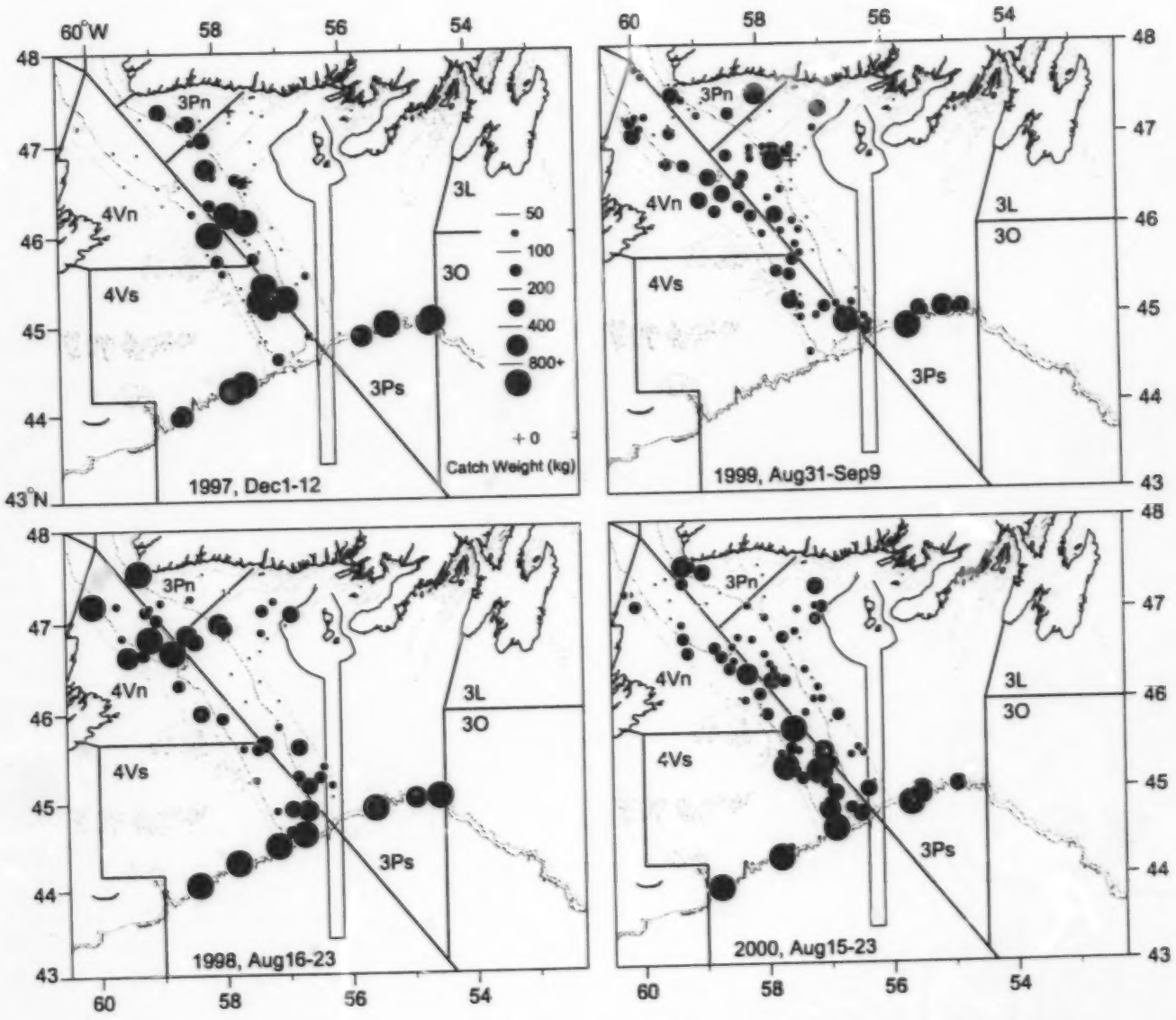


Figure 1 Redfish Catch Weight Distributions from GEAC Stratified Random Surveys, Unit 2, 1997-2000. 200, 400, and 800 m depth contours are shown.

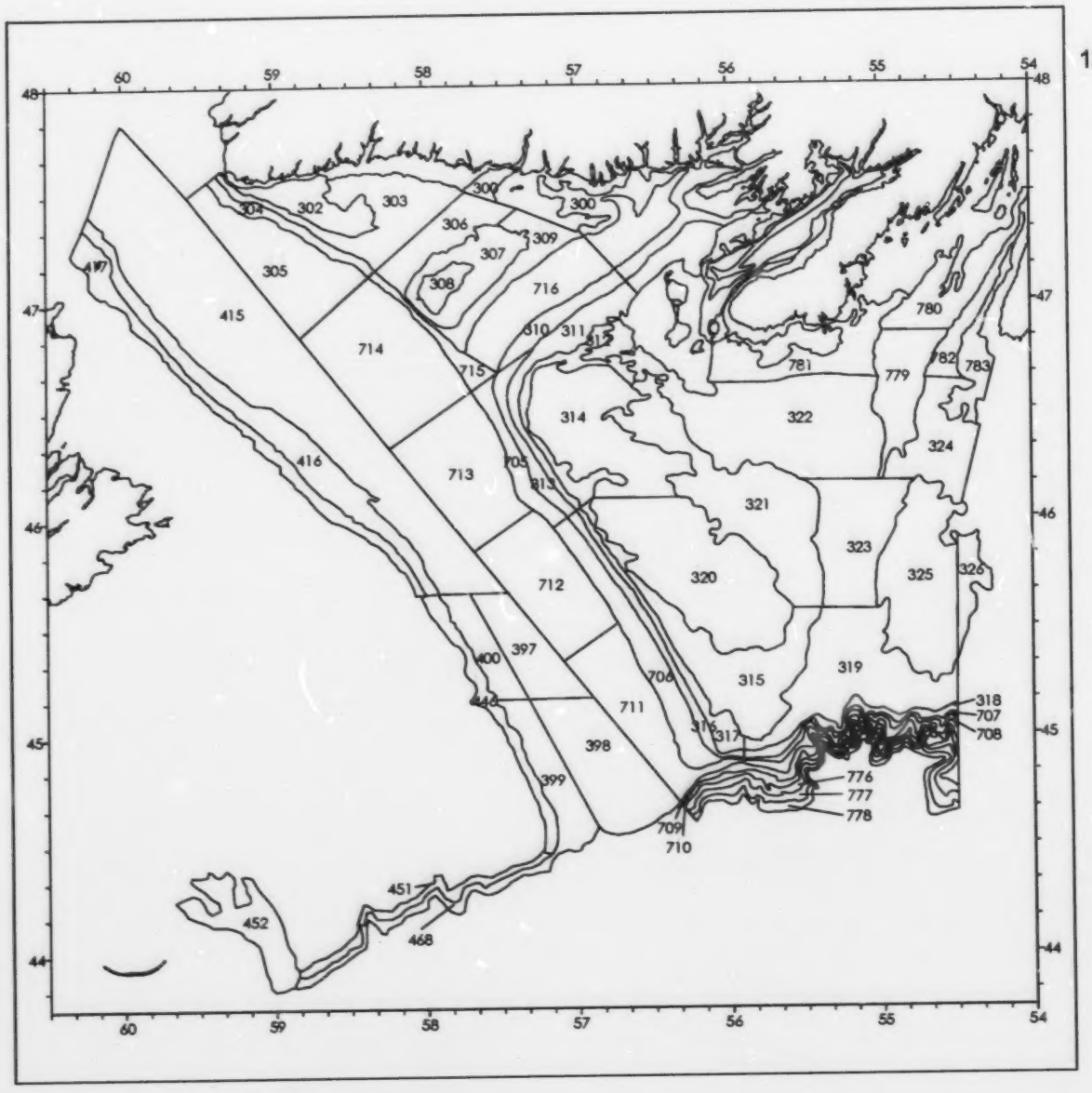


Figure 1a Stratum boundaries within Unit 2.
Numbered strata indicate those surveyed during summer GEAC survey of Unit 2.

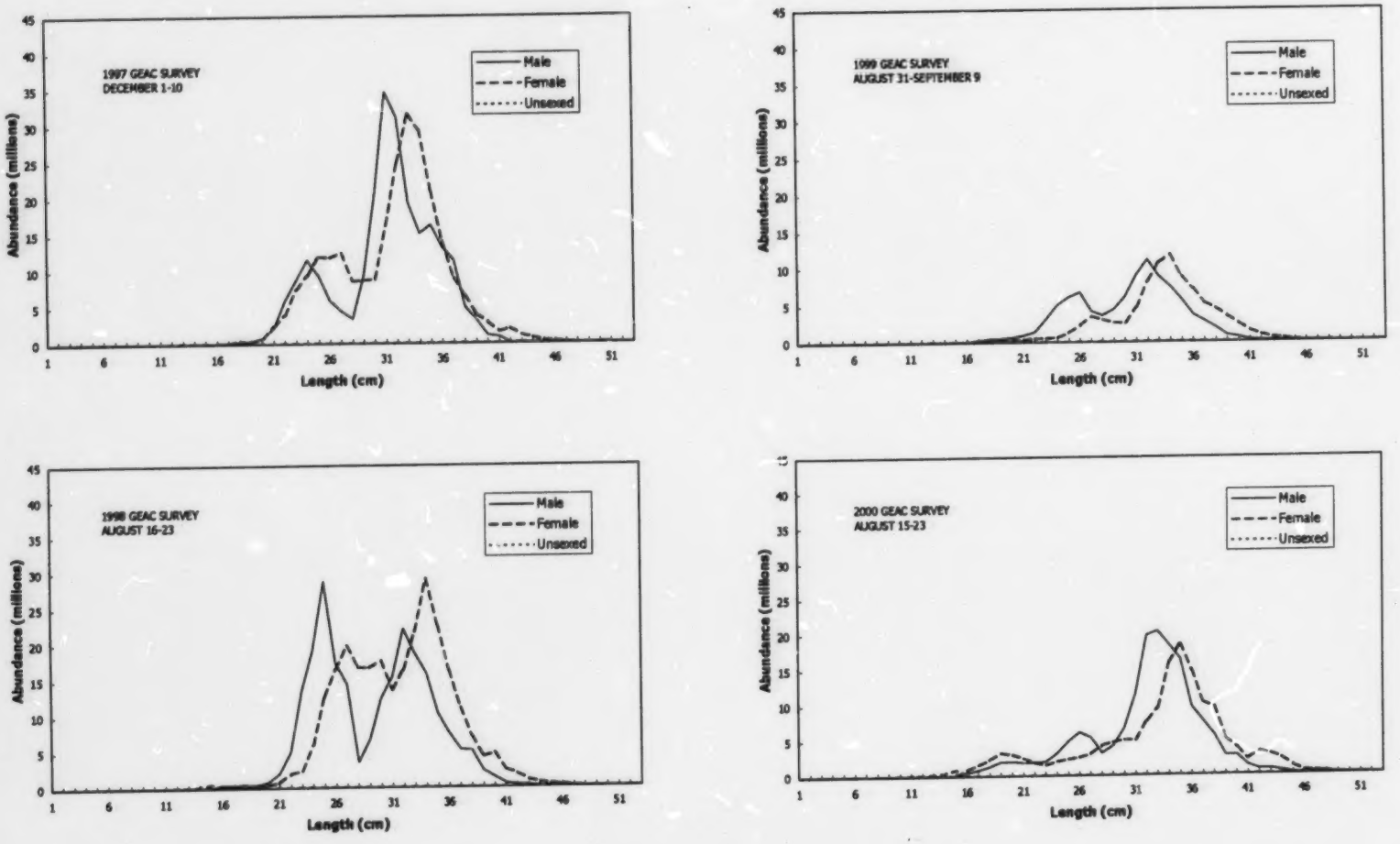


Figure 2 Redfish survey abundance index at length from GEAC Industry surveys of UNIT 2 from 1997-2000

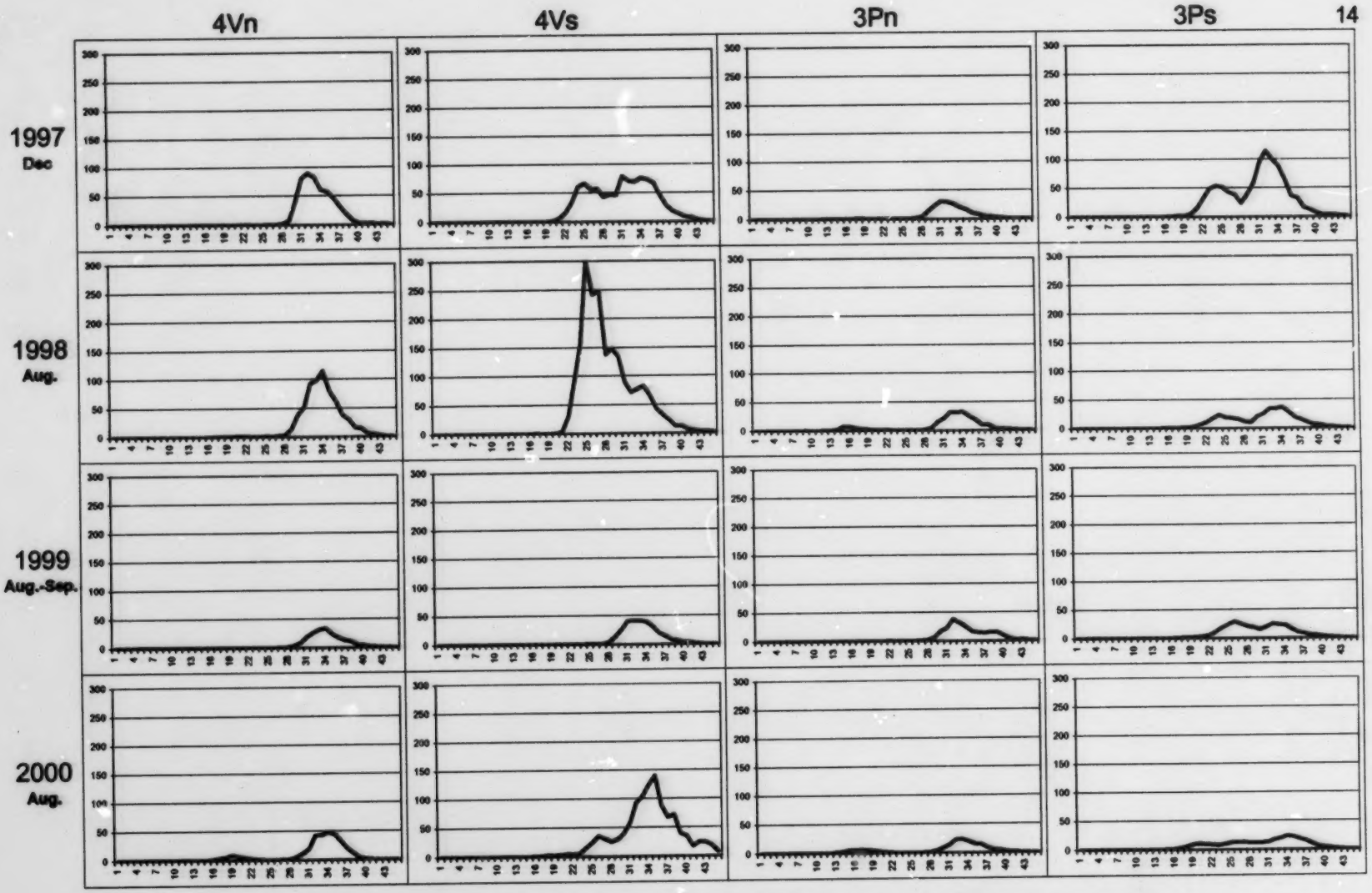
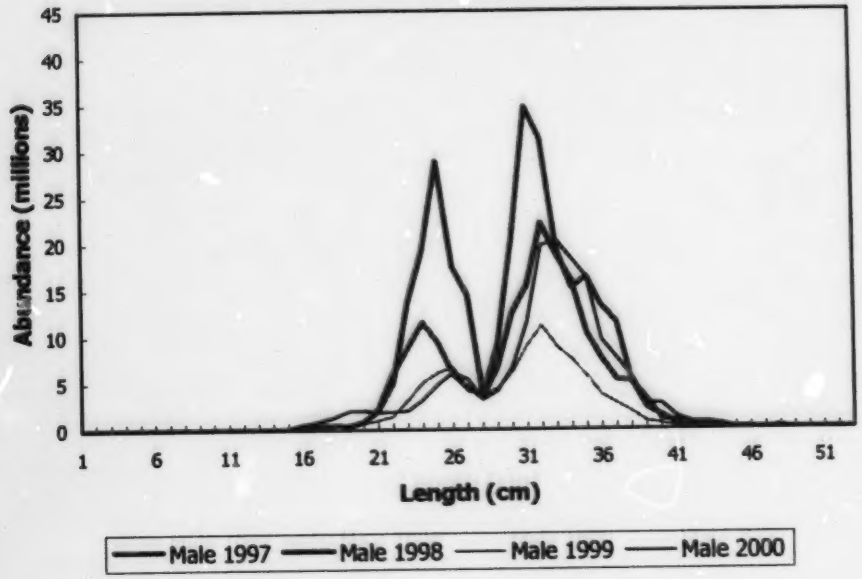


Figure 3 Length distributions from stratified-random GEAC industry surveys to UNIT2 for 1997-2000. Plotted are mean number per standard (1.75 n. mi.) tow. X-axis is forklength in centimetres. The 1997 and 1999-2000 surveys were conducted by the MV Cape Beaver and the 1998 survey by the MV Cape Ballard. All surveys utilized an Engel 170 trawl. The 2000 survey also utilized a liner.



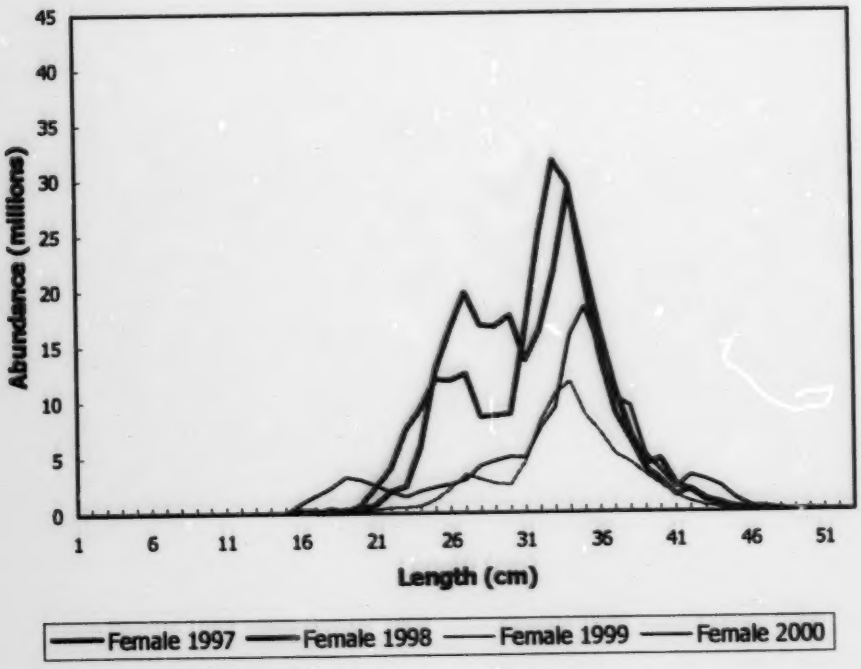


Figure 4 Redfish survey abundance index at length from GEAC Industry surveys of Unit2, 1997-2000. Distributions are shown for male and for female populations.

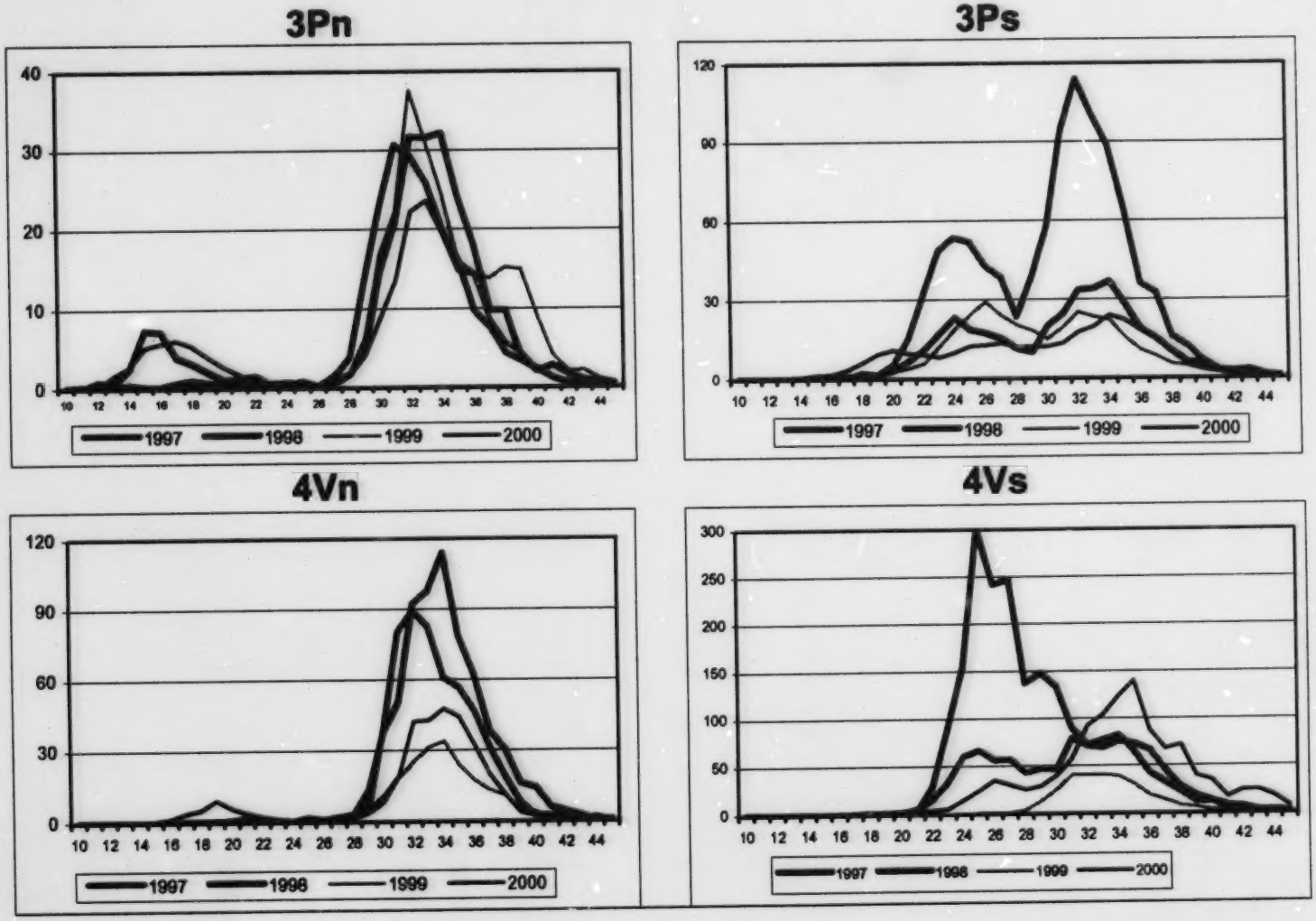


Figure 5 Length distributions as per Figure 3, showing 1997-2000, one panel for each division. Plotted are mean number per standard (1.75 n. mi.) tow. X-axis is forklength in centimetres. Note different y-axis scales.